3.4 IDAHO NATIONAL ENGINEERING LABORATORY

The Idaho National Engineering Laboratory is located in southeastern Idaho near Idaho Falls (Figure 2.2.3–1). The main site is 55 km (34 mi) west of Idaho Falls, 61 km (38 mi) northwest of Blackfoot, and 35 km (22 mi) east of Arco. There are also DOE activities in Idaho Falls. The facility has approximately 445 km (277 mi) of roads, both paved and unpaved, and 48 km (30 mi) of railroad track.

There are 450 buildings and 2,000 support structures at INEL with more than 279,000 m^2 (3,000,000 ft^2) of floor space in varying conditions of utility (Figure 2.2.3–2). INEL has approximately 25,100 m^2 (270,000 ft^2) of covered warehouse space and an additional 18,600 m^2 (200,000 ft^2) of fenced yard space. The total area of the various machine shops is 3,035 m^2 (32,665 ft^2).

There have been 52 research and test reactors at INEL used over the years to test reactor systems, fuel and target design, and overall safety. In addition to its nuclear reactor research, other INEL facilities are operated to support nuclear operations. These facilities include HLW and LLW processing and storage sites, hot cells, analytical laboratories, machine shops, laundry, railroad, and administrative facilities. Other activities include management of one of DOE's largest storage sites for LLW and TRU waste. Until 1992, spent reactor fuels were reprocessed at the ICPP to recover enriched uranium and other isotopes. Due to a DOE decision to terminate spent fuel reprocessing, the ICPP was transferred to the DOE Office of Environmental Management (EM) Program for disposition. The ICPP contains the waste calcination facility, which processes liquid HLW streams to a calcined solid (granular form). Beginning in the early part of the next century, the waste immobilization facility will convert the calcined solids into a glass ceramic for ultimate disposal in a Federal repository. Additionally, miscellaneous spent fuel from both DOE and commercial sources is scheduled for interim storage at the ICPP. Within the existing security perimeter, the Fuel Processing Restoration Facility is a special nuclear material storage and processing facility that is 95-percent complete and has never been operated.

Department activities at INEL have been divided among eight distinct and geographically separate function areas as listed in Table 3.4–1. The current functions at INEL can be further grouped into two major categories: EM activities and other DOE activities.

Department of Energy Activities. Environmental management activities include R&D for waste processing at the Power Burst Facility and providing waste management expertise to the RWMC. The Power Burst Facility supports facilities in R&D for waste reduction programs and the Boron Neutron Capture Therapy Program. Waste management efforts at INEL are directed toward safe and environmentally sound treatment, storage, and disposal of radioactive, hazardous, and sanitary waste generated from facility operations. Major waste reduction facilities include the Waste Engineering Development Facility, the Waste Experimental Reduction Facility, and the Mixed Waste Storage Facility.

The following additional DOE activities are located at INEL (see Figure 2.2.3–2):

- The Test Area North (TAN) complex is the northernmost facility within INEL and consists of several experimental reactors and support facilities conducting R&D activities on reactor performance. These facilities include the technical support facility, the containment test facility, the water reactor research test facility, and the inertial engine test facility. The inertial engine test facility has been abandoned, and no future programs are planned. The remaining facilities support ongoing programs.

- Materials testing and environmental monitoring activities were conducted in the Auxiliary Reactor Area. The facilities in this area are scheduled for D&D.

- The ANL-W facility area consists of several major complexes, including EBR II, Transient Reactor Test Facility, ZPPR, HFEF, FCF, and FMF. The EBR II was being used to demonstrate the Integral Fast Reactor concept. The Transient Reactor Test Facility and the ZPPR are used to conduct reactor

Table 3.4–1. Current Missions at Idaho National Engineering Laboratory

Mission	Description	Sponsor
Argonne National Laboratory-West	Perform breeder reactor irradiation tests Provide storage of Pu material	Office of Nuclear Energy; Assistant Secretary for Environmental Management
Radioactive Waste Management Complex	Provide waste management functions for present and future site and Department needs	Assistant Secretary for Environmental Management
Power Burst Area	Perform waste processing, technology research, and development. Provide interim storage for hazardous wastes	Assistant Secretary for Environmental Management
Test Area North	Perform research on reactor safety operations and conduct a specific manufacturing capability project	Office of Nuclear Energy
Test Reactor Area	Perform irradiation service, develop nuclear instruments, and conduct safety programs. Develop methods to meet radioactive release limits	Office of Nuclear Energy; Office of Naval Reactors
Idaho Chemical Processing Plant	Operations are focused on spent fuel storage and high level waste processing	Assistant Secretary for Environmental Management
Naval Reactors Facility	Standby facility for conducting ship propulsion reactor research and training	Office of Naval Reactors
Central Facilities Area	Provide centralized support services for the site	Idaho Operations Office

Source: INEL 1995a:1.

reactor analysis and safety experiments. The HFEF provides a large inert-atmosphere containment for handling and examining irradiated reactor fuel. The FCF has been modified for the Integral Fast Reactor program to demonstrate remote reprocessing and refabrication in the fuel cycle. The FMF is used to manufacture metallic fuel elements for the fuel cycle and store Pu material.

- Supporting facilities at ANL-W include the Radioactive Liquid Waste Treatment Facility, the Radioactive Scrap and Waste Facility, the Radioactive Sodium Storage Facility, and the Sodium Process Facility. The Radioactive Liquid Waste Treatment Facility processes low-level (aqueous) liquid waste. TRU waste from ANL-W is stored at the Radioactive Scrap and Waste Facility. Contact-handled mixed waste is stored in the Radioactive Sodium Storage Facility (sodium-contaminated), and remote-handled mixed waste is stored at the Radioactive Scrap and Waste Facility. The Sodium Process Facility was built to process reactor sodium.

- The Test Reactor Area (TRA) contains the Advanced Test Reactor. This reactor is used for irradiation testing of reactor fuels and material properties; instrumentation for naval reactors; and production of radioisotopes in support of nuclear medicine, industrial applications, research, and product sterilization. Wastes from this facility are handled by the RWMC.

- The Naval Reactors Facility is operated for DOE and the U.S. Navy by Westinghouse Electric Corporation under jurisdiction of DOE's Pittsburgh Naval Reactors Office. Included at this facility are the submarine prototypes and the expended core facility. Activities include testing of advanced design equipment and new systems for current naval nuclear power propulsion plants and obtaining data for future designs.

- The Central Facilities Area (CFA) provides sitewide support services, including transportation, shop services, health services, radiation monitoring, and administrative offices.

Non-Department of Energy Activities. Non-DOE activities at INEL include research being conducted by NOAA, USGS, and various institutions of higher learning. These activities support the designation of INEL as a National Environmental Research Park (NERP).

3.4.1 LAND RESOURCES

Land Use. The INEL is located within Bingham, Bonneville, Butte, Clark, and Jefferson Counties, 35.4 km (22 mi) west of downtown Idaho Falls in southeastern Idaho. The site covers approximately 230,700 ha (570,000 acres), all of which is owned by the Federal Government and is administered, managed, and controlled by DOE. The Federal Government also owns approximately 75 percent of the land bordering INEL; this land is administered by the BLM. Twenty-four percent of adjacent land is privately owned, with the remaining 1 percent held by the State of Idaho.

Existing Land Use. Generalized land uses at INEL and in the vicinity are shown in Figure 3.4.1–1. About 2 percent of the land within INEL (4,600 ha [11,400 acres]) is used for operating areas and facilities. The developed INEL facilities are situated within a central core area of 91,000 ha (225,000 acres) designated as open space. A buffer zone consisting of 139,600 ha (345,000 acres) surrounding the central core area has been created within INEL boundaries. The BLM has entered into a Memorandum of Understanding with DOE to permit private individuals to graze livestock on the buffer zone rangeland. However, the grazing of livestock is prohibited within the central core area and within 3.2 km (2 mi) of any nuclear facilities. Other agricultural activities consist of approximately 56 ha (138 acres) of irrigated cropland located adjacent to State Routes 28 and 33, and west of the Mud Lake community. No prime farmland lies within the INEL boundaries. In 1975, DOE designated most of INEL as an NERP. It is used by the national scientific community as an outdoor laboratory for research on changes to the natural environment caused by human activities.

Offsite land use within 3.2 km (2 mi) of INEL is shown in Figure 3.4.1–1. This offsite land is primarily used for livestock and agricultural purposes. The closest residence to INEL boundary is 300 m (984 ft) east of the site (approximately 11 km [7 mi] northwest of the unincorporated community of Mud Lake).

Two National Natural Landmarks border INEL: Big Southern Butte (2.4 km [1.5 mi] south) and Hell's Half Acre (2.6 km southeast [1.6 mi]). A portion of Hell's Half Acre National Natural Landmark is designated as a Wilderness Study Area. The Black Canyon Wilderness Study Area is located adjacent to INEL and 15 km (9 mi) west-northwest of TAN. The BLM is considering the Black Canyon Wilderness Study Area for Wilderness Area designation (DOE 1995v:4.5-2). The Cedar Butte Wilderness Study Area is located 4 km (2 mi) south of INEL and 14 km (9 mi) southeast of EBR-I. The BLM does not recommend the Cedar Butte Wilderness Study Area for Wilderness Area designation.

Land-Use Planning. Lands surrounding INEL are subject to Federal and State planning laws and regulations. Land-use planning in Idaho is derived from the *Local Planning Act* of 1975, which requires that each county adopt its own land-use planning and zoning guidelines. County plans applicable to lands bordering INEL include the *Clark County Planning and Zoning Ordinance and Land Use Plan*, the *Bonneville County Comprehensive Plan*, the *Bingham County Zoning Ordinance and Planning Handbook*, the *Jefferson County Comprehensive Plan*, and the *Butte County Comprehensive Plan* (DOE 1995v:4.2–5). Land-use planning for INEL administrative and laboratory facilities located in the city of Idaho Falls is subject to Idaho Falls planning and zoning restrictions. The Idaho Falls zoning ordinance designates these INEL facility areas as I&M-1, Industrial and Manufacturing (IN City 1995a:1).

Visual Resources. The INEL generally consists of open desert land containing sagebrush. The surrounding volcanic cones, domes, and mountain ranges are visible throughout INEL. Much of INEL is the typical open, undeveloped, desert landscape characteristic of the Snake River Plain. The generally low-density character of the INEL facilities have the appearance of commercial/industrial complexes and are dispersed throughout the site. The approximate height of these structures ranges from 3 m (10 ft) to 30 m (100 ft), with a few stacks and towers that reach 76 m (250 ft). Although many INEL facilities are visible from highways, most facilities are located over 0.8 km (0.5 mi) from public roads (DOE 1995v:4.5-1). Industrial use of the developed area within INEL is consistent with a BLM VRM Class 5 designation; other areas range from VRM Class 2 to Class 4.

The Lost River State Rest Area, located along U.S. Route 20/26 (Figure 3.4.1–1), is approximately 5 km (3 mi) southwest of the TRA. Views from the Black Canyon Wilderness Study Area (Figure 3.4.1–1) include agricultural land use and the facilities of INEL. INEL facilities are visible from the Cedar Butte Wilderness Study Area. Views of the facilities from these Wilderness Study Areas are distant and therefore have a minor effect on the overall natural appearance of the area. Craters of the Moon National Monument and Wilderness Area are both approximately 20 km (12.5 mi) southwest from the closest INEL boundary.

3.4.2 SITE INFRASTRUCTURE

Baseline Characteristics. The INEL contains extensive production, service, and research facilities. Not all of these facilities are in operation or are needed today. To support site missions, an extensive infrastructure exists, as shown in Table 3.4.2–1. Pu remaining from various research programs is stored at the ANL-W site in the ZPPR and FMF vaults. The road infrastructure provides intrasite transportation requirements. The railroad infrastructure supports large-volume deliveries of coal and oversized structural components. INEL does not have a connection to local natural gas lines.

Table 3.4.2–1. Idaho National Engineering Laboratory Baseline Characteristics

Characteristics	Current Usage	Site Availability
Transportation		
Roads (km)	445[a]	445[a]
Railroads (km)	48	48
Electrical		
Energy consumption (MWh/yr)	232,500	394,200
Peak load (MWe)	42	124
Fuel		
Natural gas (m^3/yr)	0	0
Oil (l/yr)[b]	5,820,000	16,000,000
Coal (t/yr)	11,340	11,340
Steam (kg/hr)	40,800	40,800

[a] Includes paved and unpaved roads.
[b] Amount includes fuel oil and propane.
Source: DOE 1995j; INEL 1993a:5.

The subregional electrical power pool area in which INEL is located and from which it draws its power is the Northwest Power Pool Area, a part of the Western Systems Coordinating Council. INEL draws its electrical power predominantly from hydroelectric and coal-fired power generating plants. Characteristics of this power pool are given in Table 3.4.2–2.

Table 3.4.2–2. Northwest Sub-Regional Power Pool Electrical Summary

Characteristics	Energy Production
Type Fuel[a]	
Coal	34%
Nuclear	3%
Hydro/geothermal	46%
Oil/gas	7%
Other[b]	11%
Total Annual Production	256,404,000 MWh
Total Annual Load	250,045,000 MWh
Energy Exported Annually	6,359,000 MWh
Generating Capacity	49,596 MWe
Peak Demand	33,325 MWe
Capacity Margin[c]	13,655 MWe

[a] Percentages do not total 100 percent due to rounding.

[b] Includes power from both utility and non utility sources.

[c] Capacity margin is the amount of generating capacity available to provide for scheduled maintenance, emergency outages, system operating requirements, and unforeseen electrical demand.

Source: NERC 1993a.

3.4.3 AIR QUALITY AND NOISE

Meteorology and Climatology. The climate at INEL and in the surrounding region is characteristically that of a semiarid steppe. The average annual temperature at INEL is 5.6 °C (42.0 °F); average monthly temperatures range from a minimum of -8.8 °C (16.1 °F) in January to a maximum of 20.0 °C (68 °F) in July. The average annual precipitation at INEL is 22.1 cm (8.7 in) (IN DOE 1989b:55,77). Prevailing winds at INEL are southwest to west-northwest with a secondary maximum frequency from the north-northeast to northeast. The average annual windspeed is 3.4 m/s (7.5 mph). Additional information related to meteorology and climatology at INEL is presented in Appendix F.

Ambient Air Quality. The INEL is located within the Eastern Idaho Intrastate AQCR (#61). None of the areas within INEL and its surrounding counties are designated as nonattainment areas (40 CFR 81.313) with respect to the NAAQS for criteria pollutants (40 CFR 50). The nearest nonattainment area for particulate matter is in Pocatello, about 80 km (50 mi) to the south. Applicable NAAQS and Idaho State ambient air quality standards are presented in Appendix F.

Three PSD (40 CFR 52.21) Class I areas have been designated in the vicinity of INEL: Craters of the Moon National Monument, Idaho, approximately 53 km (33 mi) west-southwest from the center of the site; Yellowstone National Park, Idaho-Wyoming, approximately 143 km (89 mi) east-northeast from the center of the site; and Grand Teton National Park, Wyoming, approximately 145 km (90 mi) east from the center of the site (IN DOE 1991b:4-11).

Since the creation of the PSD program in 1977, PSD permits were obtained by INEL for two major emission sources: the Coal-Fired Steam-Generating Facility next to the ICPP and the Fuel Processing Restoration Facility, which is not expected to be operated (IN DOE 1980a; IN DOE 1988h).

Historically, the primary emission sources of criteria air pollutants at INEL are the calcination of liquid waste, the combustion of coal for steam generation at the ICPP, and the combustion of fuel oil for heating at various INEL facilities. Other emissions and sources include fugitive particulates from waste-burial activities and coal piles, other processes, vehicles, and temporary emissions from various construction activities. A total of 26 toxic air pollutants have been identified that are emitted from existing INEL facilities in quantities exceeding the screening levels established by the State of Idaho (ID DHW 1995a:103-116; ID DHW 1995b:116-119). Emission estimates for these sources are presented in Appendix F.

Ambient concentration limits for hazardous and toxic air pollutants (to be used by the State as one of the criteria in evaluating construction permit applications for a new emission source) have been adopted by the Idaho Department of Health and Welfare (ID DHW 1995a:103-116; ID DHW 1995b:116-119). The annual emission rates of hazardous and toxic air pollutants from existing INEL facilities during 1990 are listed in Appendix F.

Table 3.4.3–1 presents the baseline ambient air concentrations for criteria pollutants and other pollutants of concern at INEL. As shown in the table, baseline concentrations are in compliance with applicable guidelines and regulations.

Noise. Major noise emission sources within INEL include various industrial facilities, equipment, and machines (for example, cooling systems, transformers, engines, pumps, boilers, steam vents, paging systems, construction and materials handling equipment, and vehicles). Most INEL industrial facilities are at a sufficient distance from the site boundary that noise levels at the boundary from these sources would not be measurable or would be barely distinguishable from background noise levels.

Table 3.4.3–1. Comparison of Baseline Ambient Air Concentrations With Most Stringent Applicable Regulations or Guidelines at Idaho National Engineering Laboratory, 1990

Pollutant	Averaging Time	Most Stringent Regulation or Guideline[a] ($\mu g/m^3$)	Baseline Concentration ($\mu g/m^3$)
Criteria Pollutants			
Carbon monoxide	8-hour	10,000[b]	284
	1-hour	40,000[b]	614
Lead	Calendar Quarter	1.5[b]	0.001
Nitrogen dioxide	Annual	100[b]	4
Ozone	1-hour	235[b]	[c]
Particulate matter less than or equal to 10 microns in diameter	Annual	50[b]	5
	24-hour	150[b]	80
Sulfur dioxide	Annual	80[b]	6
	24-hour	365[b]	135
	3-hour	1,300[b]	579
Mandated by the State of Idaho			
Total suspended particulates	Annual	60[d]	5
	24-hour	150[d]	80
Hazardous and Other Toxic Compounds			
Acetaldehyde	Annual	0.45[e]	0.011
Ammonia	Annual	180[e]	6.0
Arsenic	Annual	0.00023[e]	0.00009
Benzene	Annual	0.12[e]	0.029
Butadiene	Annual	0.0036[e]	0.001
Carbon tetrachloride	Annual	0.067[e]	0.0060
Chloroform	Annual	0.043[e]	0.00040
Cyclopentane	Annual	17,000[e]	2.7
Formaldehyde	Annual	0.077[e]	0.012
Hexavalent chromium	Annual	0.000083[e]	0.00006
Hydrazine	Annual	0.00034[e]	0.000001
Hydrochloric acid	Annual	7.5[e]	0.98
Mercury	Annual	1[e]	0.042
Methylene chloride	Annual	0.24[e]	0.006
Naphthalene	Annual	500[e]	18
Nickel	Annual	0.0042[e]	0.0027
Nitric acid	Annual	50[e]	0.64
Perchloroethylene	Annual	2.1[e]	0.11
Phosphorus	Annual	1[e]	0.30
Potassium hydroxide	Annual	20[e]	0.20
Proprionaldehyde	Annual	4.3[e]	0.30
Styrene	Annual	1,000[e]	1.3
Toluene	Annual	3,750[e]	370
Trichloroethylene	Annual	0.077[e]	0.00097

Table 3.4.3–1. Comparison of Baseline Ambient Air Concentrations With Most Stringent Applicable Regulations and Guidelines at Idaho National Engineering Laboratory, 1990—Continued

Pollutant	Averaging Time	Most Stringent Regulation or Guideline[a] ($\mu g/m^3$)	Baseline Concentration ($\mu g/m^3$)
Hazardous and Other Toxic Compounds (continued)			
Trimethylbenzene	Annual	1,230[e]	100
Trivalent chromium	Annual	5[e]	0.036

[a] The more stringent of the Federal and State standard is presented if both exist for the averaging time.

[b] Federal and State standard.

[c] Data not available from source document.

[d] State standard.

[e] Acceptable air concentrations listed in Rules for the Control of Air Pollution in Idaho apply only to new (not existing) sources and are used here as reference levels.

Note: Ozone, as a criteria pollutant, is not directly emitted or monitored by the site. See Section 4.1.3 for a discussion of ozone-related issues.

Source: 40 CFR 50; DOE 1995v; ID DHW 1995a; ID DHW 1995b.

Existing INEL-related noises of public significance are from the transportation of people and materials to and from the site and in-town facilities via buses, trucks, private vehicles, helicopters, and freight trains. Noise measurements along U.S. Highway 20 about 15 m (50 ft) from the roadway indicate that the sound level from traffic ranges from 64 to 86 dBA (IN DOE 1990b:62), and that the primary source is buses (71 to 80 dBA). While few people reside within 15 m (50 ft) of the roadway, the results indicate that INEL traffic noise might be objectionable to members of the public residing near principal highways or busy bus routes. The acoustic environment along the INEL site boundary in rural areas and at nearby areas away from traffic noise is typical of a rural location, with DNL in the range of 35 to 50 dBA (EPA 1974a:B-4). Except for the prohibition of nuisance noise, neither the State of Idaho nor its local governments have established any regulations that specify acceptable community noise levels.

3.4.4 WATER RESOURCES

Surface Water. Flowing surface water in the INEL area consists of three intermittent streams that drain the adjacent mountains: Big Lost River, Little Lost River, and Birch Creek. The streams usually begin to flow in the spring and are dry by early- to mid-summer. The Big Lost River and Birch Creek are the only surface waters that flow onto the site on a regular basis. The Little Lost River does not enter the site under normal flow conditions. Since much of the flow in these streams is diverted upstream for irrigation, it is possible that several years can pass without any flow entering the INEL boundaries. The USGS is responsible for monitoring the streams, but the only onsite monitoring station is for the Big Lost River. Surface water features near INEL are depicted in Figure 3.4.4–1.

The Big Lost River flows onto the site at the southern part of its western boundary and flows northeastward to the Big Lost River sinks (Playas 1 through 3) (DOE 1992e:4-66). Water flow in the Big Lost River is controlled by the MacKay Dam located approximately 73 km (45 mi) upstream from INEL. Local rainfall and snowmelt are the primary contributors to the surface water flows. Most precipitation is rapidly infiltrated into the soil or evaporated.

Surface water is not used on INEL as a source of drinking water, nor is it used as a receptor for wastewater discharge. Nonradioactive liquid effluents are disposed of primarily to a waste ditch, a lined evaporation pond, an industrial waste pond, five different seepage ponds, and sewage treatment facilities.

Several areas of INEL, such as TAN, TRA, and CFA currently divert stormwater into drainage ditches and discharge flow into soils away from the work area. A large drainage ditch equipped with an automatic sampler surrounds the RWMC to ensure that radionuclides are not transported from the area by stormwater.

Flooding at INEL by the Big Lost River has largely been averted by a flood diversion system constructed in 1958 and upgraded in 1984. The flood diversion system consists of a small dam to direct flow through a diversion channel into four spreading areas (IN DOE 1991b:4-17). The flood diversion system is designed to contain a 300-year flood.

Surface Water Quality. The Big Lost River (from its source to the playas) is designated by the Idaho Department of Health and Welfare's Water Quality Standards and Wastewater Treatment Requirements for the following uses: agricultural and domestic water supply, cold water biota, salmonid spawning, primary and secondary contact recreation, and special resource waters (ID DHW 1992a).

The USGS is responsible for monitoring the surface water quality at INEL. The most recent water samples collected within the facility boundaries were collected from the Big Lost River below the diversion dam in June 1995, when the river flowed for several weeks. The results of the analysis and the Idaho Water Quality Standards for the Protection of Domestic Water Supplies are presented in Table 3.4.4–1. The analytical results indicate that there are no parameters in exceedance of the water quality criteria.

Surface Water Rights and Permits. Surface water rights are not an issue at INEL because INEL facilities do not withdraw surface water for use nor do they discharge effluents directly to natural surface waters.

Groundwater. The Snake River Plain Aquifer, classified by EPA as a Class I sole source aquifer, is located beneath the entire INEL site and covers a total area of approximately 24,860 km^2 (9,600 mi^2) in southeastern Idaho. The aquifer serves as a primary source for drinking water and crop irrigation in the Snake River Basin (IN DOE 1995f:99). It is composed of 610 to 3,048 m (2,000 to 10,000 ft) of lava flows, rhyolite, and interbedded sediments and is believed to contain 1,200 to 2,500 trillion l (317 to 660 trillion gal) of water.

Water from Henry's Fork of the Snake River infiltrates the subsurface and supplies a significant amount of water to the Snake River Plain Aquifer below INEL. Additional recharge to the aquifer comes from the Big Lost River,

Little Lost River, and Birch Creek, which originates in the mountains to the northwest of INEL, flows onto the site during a few months of the year, and sinks into its porous soils. Precipitation and snowmelt also contribute to its recharge. Local groundwater movement is complicated, but overall, groundwater flows laterally at an average rate of 1.5 to 6.1 m (4.9 to 20 ft) per day to the south and southwest, as shown in Figure 3.4.4–2. The groundwater emerges in springs (about 8 trillion l [2.1 trillion gal] annually) along the Snake River from Milner (located to the west of Burley) to Bliss, Idaho, and from Blackfoot to American Falls Reservoir in the region west of Pocatello, Idaho (IN DOE 1995f:3). Depth to the water table ranges from 60 m (200 ft) below the ground surface in the northeast corner of INEL to 300 m (1,000 ft) in the southeast corner (DOE 1992e:4-69).

Table 3.4.4–1. Summary of Big Lost River Surface Water Quality Monitoring at Idaho National Engineering Laboratory, 1995

Parameter	Unit of Measure	Water Quality Criteria[a]	Maximum Water Body Concentration
Arsenic	mg/l	0.05[b]	.0002
Barium	mg/l	1.0[c]	<0.0085
Cadmium	mg/l	0.005[b]	<0.001
Chromium	mg/l	0.05[c]	0.0042
Lead	mg/l	0.015[b]	<0.001
Mercury	mg/l	0.002[b,c]	<0.0001
pH	pH units	6.5-8.5[c]	8.4
Selenium	mg/l	0.01[b,c]	0.001
Silver	mg/l	0.05[b,c]	<0.001
Temperature	°C	22[c]	15

[a] For comparison purposes only.
[b] National Primary Drinking Water Regulation (40 CFR 141).
[c] State of Idaho Water Quality Criteria.
Source: ID DHW 1992a; IN USGS 1995a.

Perched water tables occur in the INEL area. The presence of these perched water bodies is believed to be beneficial to water quality in the Snake River Plain Aquifer. These perched water bodies slow waste migration, allow for radioactive decay, and spread any waste plumes over a wider area for greater dilution (DOE 1992e:4-70).

Groundwater Quality. There are several "networks" of monitoring wells drilled and maintained by USGS. These include the INEL-wide facility groundwater monitoring group and well networks for RCRA- and CERCLA-required monitoring. Groundwater beneath INEL is monitored by groups including USGS, DOE's site contractor, LITCO, other DOE contractors, and the State of Idaho. USGS has drilled more than 120 wells in the Snake River Plain Aquifer and 100 in the perched zone on and near INEL. Water supply wells, monitoring wells, and offsite water supply wells are routinely sampled for chemical and radiological constituents (DOE 1992e:4-70).

Historically, there has been radionuclide contamination of the Snake River Plain Aquifer. Between 1952 and 1988, approximately 30,900 Ci of tritium were disposed of into wells and infiltration ponds at INEL (mainly from the ICPP, TRA, and also the TAN). No tritium is currently disposed of to the groundwater at INEL, but large tritium plumes are present in the Snake River Plain Aquifer and in perched groundwater under the ICPP and TRA (Figure 3.4.4–2) (IN USGS 1988a:7). Tritium occurs at elevated levels in some monitoring wells and has been detected in groundwater near the southern boundary of INEL, 14.5 km (9 mi) south of the ICPP and TRA. The average concentration of tritium in water from six INEL production wells has remained constant since 1990 (IN DOE 1995f:72). In 1994, the highest tritium concentrations occurring in INEL drinking water were in the area of the CFA; the concentration ranged from 12,600 to 18,000 pCi/l (47,697 to 68,138 pCi/gal) (IN DOE

1995f:71). The elimination of tritium disposal, coupled with its radioactive decay, and dilution and dispersion within the groundwater reservoir are factors contributing to a 93-percent decrease in tritium concentration levels from 1961 to 1994.

Other radionuclides of significance include Cs-137, I-129 and Sr-90. Cs-137 is strongly adsorbed on mineral grains in the soils, so it is unlikely that it will reach the aquifer in significant amounts. As shown in Figure 3.4.4–2, plumes have been delineated for Sr and I.

Groundwater contamination from the injection well at TAN is being remediated as specified in a 1994 ROD and subsequent Fact Sheet. Another 1994 ROD addresses groundwater contamination at RWMC. Buried drums in this area released VOCs (for example, trichloroethylene) that have migrated downward to the Snake River Plain Aquifer. However, concentrations of these compounds were found to be below drinking water standards (IN DOE 1995f:32).

Samples from 32 offsite USGS wells beyond the southern and western site boundaries were taken in 1994. All gross alpha concentrations were within the expected concentration range for naturally occurring alpha activity in the aquifer underlying the INEL and surrounding areas. According to USGS reports, alpha-emitting wastes from site operations have not migrated far from their entrance into the aquifer near ICPP (IN DOE 1995f:69). None of the offsite water samples collected during 1994 contained detectable concentrations of tritium or gross beta activity radionuclides.

Nonradioactive wastes, including sodium chloride, sulfuric acid, sodium hydroxide, and organics, have also been discharged to ponds within many of the operating areas. In the past, wastewater has also been injected into deep disposal wells at the TRA and ICPP. The TDS concentrations of the injected wastewaters were approximately twice those present in the natural groundwater (IN USGS 1988a:20). There are no plans to use injection wells for future wastewater disposal. Monitoring of the Snake River Plain Aquifer for nonradiological constituents, including sodium chloride, total chromium, trace metals, and nitrates, showed concentrations for these contaminants to be at or below background levels at least 4 km (2.5 mi) inside the nearest site boundary (IN DOE 1994c:54).

Only nonradioactive and nonhazardous liquid wastes are currently discharged into the sanitary and service waste disposal systems. All hazardous and radioactive wastes are stored or disposed of in approved facilities designed to preclude further groundwater contamination. Groundwater quality data is shown in Table 3.4.4–2.

Groundwater Availability, Use, and Rights. The Snake River Plain Aquifer is the source of all water used at INEL. The combined pump capacity of the 27 onsite production wells averaged approximately 7.9 billion l/yr (2.1 billion gal/yr) from 1982 through 1985. This is 0.3 percent of the 2.44 trillion l/yr (645 billion gal/yr) of groundwater withdrawn from the aquifer in the Eastern Snake River Plain. Most of the water withdrawn from the aquifer in the Eastern Snake River Plain (2.34 trillion l/yr [619 billion gal/yr]) is used for agriculture. After use and treatment, approximately 63 percent of the quantity of groundwater withdrawn at INEL is disposed of in wells and ponds (DOE 1992e:4-73).

In the INEL ROI, Idaho Falls, Pocatello, and Rigby maintain water supply systems. All of the community drinking water systems draw their raw water from the Snake River Plain Aquifer. In 1991, the combined water supply capacity for these systems was approximately 538 million l/day (142.1 million gal/day). The combined demand averaged about 204 million l/day (53.9 million gal/day), or 38 percent of capacity.

The Department holds a Federal Reserved Water Right for the INEL site, which permits a water pumping capacity of 2.3 m^3/s (80 ft^3/s) and a maximum water consumption of 43 billion l/yr (11.4 billion gal/yr) for drinking, process water, and noncontact cooling (DOE 1992e:4-74). Because it is a Federal Reserved Water Right, INEL's priority on water rights dates back to its establishment in 1950. The legal and administrative framework for the water rights adjudication process is currently being evaluated for the State of Idaho.

Table 3.4.4–2. Groundwater Quality Monitoring at Idaho National Engineering Laboratory, 1994

Parameter	Unit of Measure	Water Quality Criteria and Standards[a]	Drinking Water and Production Wells	
			High	Low
1-Dichlorobenzene	mg/l	0.075[b]	0.0007	0.0007
1,1,1-Trichloroethane	mg/l	0.2[b]	0.0028	<dL
Alpha (gross)	pCi/l	15[b]	2.8	<dL
Barium	mg/l	1.0[c]	0.09	0.003
Beta (gross)	pCi/l	50[d]	8.0	<dL
[Text deleted.]				
Carbon tetrachloride	mg/l	0.005[b]	0.0006	<dL
Chloroform	mg/l	0.1[b]	0.0047	<dL
Chromium	mg/l	0.05[b]	0.007	0.003
Strontium-90	pCi/l	400[e]	0.8	<dL
Tetrachloroethylene	mg/l	0.005[b]	0.0047	<dL
Trichloroethylene	mg/l	0.005[b]	0.0166	<dL
Tritium	pCi/l	80,000[e]	18,000	1,300

[a] For comparison purposes only.

[b] National Primary Drinking Water Regulations (40 CFR 141).

[c] State water quality criteria.

[d] Proposed National Primary Drinking Water Regulations; Radionuclides (56 FR 33050).

[e] DOE's DCG for water (DOE Order 5400.5). DCG values are based on a committed effective dose equivalent of 100 mrem per year; however, because the drinking water maximum contaminant level is based on 4 mrem per year, the number listed is 4 percent of the DCG.

Note: dL=detection limit.

Source: IN DOE 1995f.

3.4.5 GEOLOGY AND SOILS

Geology. The INEL occupies a relatively flat area on the northwestern portion of the Eastern Snake River Plain. The INEL area consists of a broad plain that has been built up from the eruptions of multiple flows of basaltic lava. INEL is bordered by Centennial Range Mountains on the north and the overthrust belt on the east. The Eastern Snake River Plain consists of Miocene and younger volcanic rocks that probably rest upon older sedimentary and plutonic rocks, as well as faulted remains of Eocene volcanic rocks. Within INEL, economically viable sand, gravel, and pumice resources have been identified. Several quarries have supplied these materials to various onsite construction projects.

The oldest faults in the region occur both to the north and south of INEL and are approximately 40 to 65 million years old. The Arco Segment of the Lost River Fault and the Howe Segment of the Lemhi Fault are range-front normal faults associated with the Basin and Range Province and have been active during recent geologic time (100,000 to 15,000 years ago); they are considered to be the closest capable faults to INEL by the definition outlined in 10 CFR 100, Appendix A. These faults terminate approximately 30 km (19 mi) from the INEL boundary (Figure 3.4.5–1).

The INEL is located in Seismic Zone 2B. For this PEIS, Uniform Building Code Seismic Zones 2A and 2B are included in Seismic Zone 2 (Figure 3.2.5–1), indicating that moderate damage could occur as a result of an earthquake. Seismic Zone 3 is located in adjacent regions to the north, east, and south of INEL.

The INEL is situated on the Eastern Snake River Plain, an area of low seismicity. The Plain is bordered by the seismically active Centennial Tectonic Belt to the north and the Intermountain Seismic Belt to the east and southeast. Historical and recent seismic data cataloged by NOAA, the National Earthquake Information Center (NEIC), the University of Utah, and the INEL Seismic Network indicates that earthquakes in the region occur primarily in the Intermountain Seismic Belt and Centennial Tectonic Belt (including the mountains and valleys of the Basin and Range province which bound the Plain on the north and south) (IN DOE 1991b:4-28). The seismic characteristics of the Plain and the adjacent Basin and Range province are different; earthquakes and active faulting are associated with the Basin and Range tectonic activity, whereas the Plain has historically experienced few and small earthquakes (DOE 1995j:4.6-1).

[Text deleted.] Historically there have been several earthquakes in the region surrounding INEL (Figure 3.4.5–1). However, none of these occurred within approximately 48 km (30 mi) of the site. The largest historic earthquake near INEL took place in 1983, approximately 107 km (66 mi) to the northwest, near Borah Peak in the Lost River Range. The earthquake had a Richter magnitude of 7.3 with a resulting peak ground acceleration of 0.022 to 0.078 g at INEL (DOE 1995j:4.6-1). An earthquake of greater than 5.5 magnitude can be expected approximately every 10 years within a 321-km (200-mi) radius of INEL.

The only recorded earthquake on the Eastern Snake River Plain with a Richter magnitude greater than 5.5 was the 1905 event that had a magnitude of 5.7. Recent interpretations of the event, however, have suggested that its epicenter was more likely to have been in Utah or Nevada. The distribution of earthquakes at and near INEL from 1884 to 1989 (Figure 3.4.5–1) clearly shows that the Eastern Snake River Plain has a low rate of seismicity.

Volcanic hazards at INEL can come from sources inside or outside the Snake River Plain. Volcanic hazards include the effects of lava flows, ground deformation (fissures, uplift, subsidence), volcanic earthquakes (associated with magmatic processes as distinct from earthquakes associated with tectonics), and ash flows or airborne ash deposits. Most of the basaltic volcanic activity occurred from 4 million to 2,100 years ago at the Craters of the Moon National Monument 20 km (12.5 mi) southwest of INEL. The rhyolite domes along the Axial Volcanic Zone formed between 1.2 and 0.3 million years ago and have a recurrence interval of about 200,000 years. Therefore, the probability of future dome formation affecting INEL site facilities is very low (DOE 1995j:4.6-9).

Catastrophic Yellowstone type volcanic eruptions have occurred three times in the past 2 million years, but the INEL site lies more than 160 km (99 mi) southwest from the Yellowstone Caldera rim, and high-altitude winds would not disperse Yellowstone ash in the direction of INEL. Additionally, the infrequency, distance, and unfavorable dispersal of pyroclastic flows or ash fallout from future Yellowstone eruptions are not expected to affect the INEL site (DOE 1995j:4.6-9).

Basaltic lava flows and eruptions from fissures or vents have been considered in this PEIS. Based on a probability analysis of the volcanic history in and near the southcentral INEL area, the Volcanism Working Group estimated that the conditional probability that basaltic volcanism would affect a south-central INEL site location is less than 2.5×10^{-5} per year (once per 40,000 years or longer), where the hazard associated with Axial Volcanic Zone volcanism is greatest. The probability of a volcanic event affecting INEL site facilities farther north, where both silicic and basaltic volcanism have been older and less frequent, is estimated to be less than 1.0×10^{-6} per year (once every million years or longer). The statistics of 116 measured INEL-area lava flow lengths and areas were used to define the two lava flow hazard zones (Figure 3.4.5–2). The mean lava flow length plus one standard deviation from the mean corresponds to 14 km (8.7 mi). The hazard for a particular site within or near a volcanic zone is much lower, typically by an order of magnitude or more, and must be assessed on a site-specific basis (DOE 1995j:4.6-9).

Soils. The INEL soils are derived from volcanic and clastic rocks from nearby highlands (IN DOE 1986a:4). In the southern part of INEL, the soils are gravelly to rocky and generally shallow. The northern portion is composed mostly of unconsolidated clay, silt, and sand. Generally, the soils are acceptable for standard construction techniques and consist of wind-blown sand and silt lying in patches over a bedrock of basaltic lava. These soils have a low-to-moderate water erosion hazard and a moderate-to-high wind erodibility. Shrink-swell potential is generally low to moderate.

3.4.6 BIOLOGICAL RESOURCES

Terrestrial Resources. The INEL lies in a cool desert ecosystem dominated by shrub-steppe communities. Most land within the site is relatively undisturbed and provides important habitat for species native to the region. Facilities and operating areas occupy 2 percent of INEL; approximately 60 percent of the area around the periphery of the site is grazed by sheep and cattle (DOE 1992e:4-76). Although sagebrush communities occupy about 80 percent of INEL, a total of 20 plant communities have been identified (IN DOE 1986a:4) (Figure 3.4.6–1). The interspersion of low and big sagebrush communities in the northern portion of INEL, and the juniper communities located in the northwestern and southeastern portions of the site are considered sensitive habitats (IN DOE 1986a:4,8). The former provides critical winter and spring range for sage grouse and pronghorn, while the latter is important to nesting raptors and songbirds. Riparian vegetation, primarily cottonwood and willow, along the Big Lost River and Birch Creek also provides nesting habitat for hawks, owls, and songbirds (DOE 1992e:4-76). In total, 398 plant taxa have been documented on INEL (IN DOE 1978a:129-131).

The INEL supports numerous animal species, including 1 amphibian, 9 reptile, 184 bird, and 37 mammal species (DOE 1992e:4-76). Common animals on INEL include the short-horned lizard, gopher snake, sage sparrow, Townsend's ground squirrel, and black-tailed jackrabbit. Important game animals include the sage grouse, mule deer, elk, and pronghorn. During some winters, 4,500 to 6,000 pronghorn, or about 30 percent of Idaho's total population, may be found on INEL. Pronghorn wintering areas are located in the northeastern portion of the site, in the area of the Big Lost River sinks, in the west-central portion of the site along the Big Lost River, and in the south-central portion of the site (IN DOE 1978a:221-222). Hunting is permitted only within about 1 km (0.6 mi) of the northern site boundary. Pronghorn, which is the only species taken, are hunted in order to control damage to agricultural land (INEL 1992a:2). Numerous raptors, such as the golden eagle and prairie falcon, and carnivores, such as the coyote and mountain lion, are also found on INEL. A variety of migratory birds has been found at INEL. Migratory birds, as well as their nests and eggs, are protected by the *Migratory Bird Treaty Act*. Eagles are similarly protected by the *Bald and Golden Eagle Protection Act*.

Within the proposed site for the storage facility (which is also the assumed analysis site for the evolutionary LWR), shallow soils (which occupy most of the area) are dominated by big sagebrush (Figure 3.4.6–1). In low-lying areas of deep soil, the dominant vegetation is perennial grasses. Isolated stands of juniper also exist in the area. Cheatgrass, an aggressive European annual that readily replaces native species in disturbed areas, is also present. Elk use areas in the vicinity of the site during the fall, winter, and spring, but pronghorn use is relatively low. Pronghorn wintering areas are located no closer than about 6.5 km (4 mi) from the site area. Sage grouse are known to use the site but not for breeding. The isolated stands of juniper in the area provide potential nesting habitat for hawks and owls (DOE 1992e:4-76).

Wetlands. The NWI maps prepared by the USFWS have been completed for most of INEL. The NWI maps indicate that the primary wetland areas are associated with the Big Lost River, the Big Lost River spreading areas, and the Big Lost River sinks, although smaller (less than about 0.4 ha [1 acre]) isolated wetlands also occur. Wetlands associated with the Big Lost River are classified as riverine/intermittent, indicating a defined stream channel with flowing water during only part of the year.

The Big Lost River spreading areas and Big Lost River sinks are seasonal wetlands and are located approximately 15 km (9.3 mi) southwest and 24 km (14.9 mi) north of the proposed new consolidated Pu storage facility site (and analysis site for the evolutionary LWR), respectively (Figure 2.3–3). These areas can provide more than 809 ha (2,000 acres) of wetland habitat during wet years. Riparian wetland vegetation exists along the Big Lost River and along Birch Creek. Plants found along the Big Lost River, which is located about 2.5 km (1.6 mi) west of the proposed site, are in poor condition due to recent years of only intermittent flows.

Aquatic Resources. Aquatic habitat on INEL is limited to the Big Lost River, Little Lost River, Birch Creek, and a number of liquid-waste disposal ponds (see Figure 3.4.4–1). All three streams are intermittent and drain

into four sinks in the north-central part of INEL. Historically, six species of fish have been observed in the Big Lost River: brook trout, rainbow trout, mountain whitefish, speckled dace, shorthead sculpin, and kokanee salmon (DOE 1992e:4-78; DOE 1992h:G-11).

The Little Lost River, located west of INEL, and Birch Creek, located north of the proposed new consolidated Pu storage facility site (and assumed analysis site for the evolutionary LWR), enter INEL only during periods of high flow (IN EG&G nda:22). Surveys of fish in these surface water bodies have not been conducted. The liquid waste disposal ponds on INEL, while considered aquatic habitat, do not support fish (INEL 1992a:4). No aquatic habitat occurs on the proposed site, which is located about 2.5 km (1.6 mi) east of the Big Lost River.

Threatened and Endangered Species. Nineteen federally and State-listed threatened, endangered, and other special status species may be found on and in the vicinity of INEL. Two of these species are federally and State-listed as threatened or endangered (Table 3.4.6–1). Twelve species listed in Table 3.4.6–1 have been observed at INEL, including the two threatened and endangered species. Once specific project locations have been determined, site surveys will determine the presence of special status species. No critical habitat for threatened or endangered species, as defined in the ESA (50 CFR 17.11; 50 CFR 17.12), exists on INEL (DOE 1992e:4-78).

The bald eagle has rarely been seen in the western and northern portions of INEL. The peregrine falcon has only occasionally been observed in the northern portions of the site. [Text deleted.]

Several of the species listed in Table 3.4.6–1 may occur in the vicinity of the proposed storage site (and assumed location for the evolutionary LWR). The pygmy rabbit is common at INEL, but its distribution is patchy (DOE 1995j:4.9-4). The Townsend's western big-eared bat (which roosts in caves at INEL) and the other bat species have not been observed in the area of the proposed site but could potentially occur. [Text deleted.]

The State of Idaho does not maintain a list of threatened or endangered plant species. Plants that are considered rare in Idaho are included in a State Watch List. The tree-like oxytheca, listed by the State as a sensitive species, has been found in the area of the proposed site (DOE 1992e:4-79).

Table 3.4.6–1. Federally and State-Listed Threatened, Endangered, and Other Special Status Species That May Be Found on or in the Vicinity of Idaho National Engineering Laboratory

Common Name	Scientific Name	Status[a]	
		Federal	State
Mammals			
Fringed myotis	*Myotis thysanodes*	NL	SSC
[Text deleted.]			
Pygmy rabbit[b]	*Brachylagus idahoensis*	NL	SSC
[Text deleted.]			
Spotted bat	*Euderma maculatum*	NL	SSC
Townsend's western big-eared bat[b]	*Plecotus townsendii townsendii*	NL	SSC
Western pipistrelle	*Pipistrellus hesperus*	NL	SSC
[Text deleted.]			
Birds			
American white pelican	*Pelecanus erythrorhynchos*	NL	SSC
Bald eagle[b,c]	*Haliaeetus leucocephalus*	T	E
Common loon	*Gavia immer*	NL	SSC
[Text deleted.]			
Great egret	*Casmerodius albus*	NL	SSC
Northern goshawk	*Accipiter gentilis*	NL	SSC
Peregrine falcon[b,c]	*Falco peregrinus*	E (S/A)	E
[Text deleted.]			
Plants[d]			
King's bladderpod[b]	*Lesquerella kingii var. cobrensis*	NL	M
Lemhi milkvetch[b]	*Astragalus aquilonius*	NL	S
Nipple cactus[b]	*Coryphantha missouriensis*	NL	M
Painted milkvetch[b]	*Astragalus ceramicus var. apus*	NL	M
Plains milkvetch[b]	*Astragalus gilviflorus*	NL	SP1
Spreading gilia[b]	*Ipomopsis polycladon*	NL	SP2
Tree-like oxytheca[b]	*Oxytheca dendroidea*	NL	S
Winged-seed evening primrose[b]	*Camissonia pterosperma*	NL	S

[a] Status codes: E=endangered; M=monitor; NL=not listed; S=sensitive; S/A=protected under the similarity of appearance provision of the ESA; SP1=State Priority 1 (in danger of becoming extinct in the state); SP2=State Priority 2 (likely to be classified as Priority 1 if factors contributing to decline remain unchanged); SSC=State special concern.

[b] Species observed on INEL.

[c] USFWS Recovery Plan exists for this species.

[d] State status of plant species is designated by the Idaho Native Plant Society.

Source: 50 CFR 17.11; 50 CFR 17.12; DOE 1992e; DOE 1995j; ID DFG 1994a; IN DOE 1984a.

3.4.7 CULTURAL AND PALEONTOLOGICAL RESOURCES

Prehistoric Resources. Prehistoric resources identified on INEL include residential bases, campsites, rock shelters, hunting blinds, rock alignments, lithic quarries, and limited activity locations, including lithic and ceramic scatters, hearths, and concentrations of fire-affected rock. As of 1994, over 100 cultural resources surveys had been conducted, and approximately 4 percent of INEL had been inventoried for cultural resources (DOE 1995v:4.4-1). Resources include 688 prehistoric sites and 753 prehistoric isolates. Of the prehistoric sites that have been recorded, approximately 95 percent are lithic scatters or locations. Most sites have not yet been formally evaluated and are considered potentially eligible for the NRHP. Additional NRHP-eligible sites are likely to occur on INEL. A Draft Cultural Resources Management Plan has been prepared and is currently in the comment stage.

Historic Resources. Thirty-eight historic sites and 27 historic isolates have been identified on INEL; most are related to either agriculture (for example, homesteads and irrigation canals) or ranching (for example, sheep and cattle camps). Goodale's Cutoff, a spur of the Oregon Trail, is still recognizable in the southwestern corner of INEL. Experimental Breeder Reactor I, the first reactor to achieve a self-sustaining chain reaction using Pu instead of uranium as the principal fuel component, is listed on the NRHP and is designated a National Historic Landmark. Various other nuclear reactors and associated buildings, such as those at Auxiliary Reactor Area-I, -II, -III, the Borax Reactor, Materials Test Reactor, Engineering Test Reactor, and the Hot Shop, are considered eligible for the NRHP. Although such facilities are not yet 50 years old, they are of exceptional scientific and engineering significance and have played major roles in the development of nuclear science since World War II. Based on current studies, additional historic sites are likely to occur in unsurveyed portions of INEL.

Native American Resources. At the time of European-American contact, the area was inhabited by nomadic hunters and gatherers consisting of two linguistically distinct groups: the Shoshone and the Bannock. Horses enabled the Shoshone and Bannock to increase their foraging range, congregate in larger groups, and protect their possessions from other groups. Winter camps were reportedly scattered along major river drainages. Groups dispersed during the other seasons, probably moving across what is now INEL as they used floral and faunal resources, and obsidian from Big Southern Butte or Howe Point.

Important Native American resources that might be found in the proposed project area include buttes, caves, village shrines, rock art, burials, vision quest sites, and plants such as bluegrass, willow, and cattail. It is worth noting that many natural resources at INEL are viewed as cultural resources by Native Americans. As one example, sagebrush is used as a tool, for clothing, and for medicinal purposes. INEL recently initiated general consultation with the Shoshone-Bannock tribe and a Working Agreement between the two groups exists. While specific sites or traditional use areas have not yet been identified, the Shoshone and Bannock tribes consider INEL part of their ancestral homeland and have expressed support for the use of scientific methods to preserve cultural resources.

Paleontological Resources. The Snake River Plain is composed of numerous superimposed basalt lava flows that came from low-shield volcanoes, fissures, and tubes during the last two billion years. Except for a small area of Paleozoic deposits in the northwest corner of INEL, almost 75 percent of the facility is basalt flows covered with loess. The remainder of INEL (primarily in the north and northwest portions of the facility) is alluvial and aeolian sediments; fluvial sediments are found along the drainages.

As of 1994, 31 fossil localities have been identified at INEL. Fluvial sediments have yielded Late Pleistocene terrestrial vertebrate fossils, including mammoth, mastodon, horse, camel, and bison. Gastropods, microfauna, plant fossils, opal phytoliths, and pollen have also been recovered. Volcanic tubes and blisters serve as sediment traps and many in the older basalt flows contain fossils of small and medium-sized mammals. While most of these fossils date to the Holocene (within the last 10,000 years), some date to the Pleistocene-Holocene transition of about 11,500 years ago. Because these assemblages may contain both vertebrate and floral remains, such localities would have high research potential.

3.4.8 SOCIOECONOMICS

Socioeconomic characteristics described for INEL include employment and regional economy, population and housing, community services, and local transportation. Statistics for employment and regional economy are presented for the REA that encompasses 13 counties around INEL located in Idaho and Wyoming (Table L.1–1). Statistics for population and housing, community services, and local transportation are presented for the ROI, a five-county area (located in Idaho) in which 97.2 percent of all INEL employees reside: Bannock County (5.6 percent), Bingham County (12.6 percent), Bonneville County (69.2 percent), Butte County (2.5 percent), and Jefferson County (7.3 percent). [Text deleted.] In 1996, INEL employed 6,547 persons (IN DOE 1996b:1) (This total does not include some contractor employees.)

Regional Economy Characteristics. Selected employment and regional economy statistics for the INEL REA are summarized in Figure 3.4.8–1. Between 1980 and 1990, the civilian labor force in the REA increased 10.4 percent to the 1990 level of 119,700. The 1994 unemployment in the REA was 5.4 percent, which was about the same as the unemployment for Idaho (5.6 percent) and Wyoming (5.3 percent). The region's per capita income of $16,674 in 1993 was approximately 5 percent less than Idaho's per capita income of $17,511 and 15.4 percent less than Wyoming's per capita income of $19,719.

In 1993, the percentage of total employment involving the private sector activity of retail trade was similar in the REA (18 percent), Idaho, and Wyoming as shown in Figure 3.4.8–1. Service activities in the REA (27 percent of total employment) represented about a 4- and 4.5-percent greater share than in Idaho and Wyoming, respectively. Manufacturing in the REA (9 percent) represented a 3-percent smaller share of total employment than in Idaho and a 6-percent larger share than in Wyoming.

Population and Housing. In 1994, the ROI population totaled 212,610. Between 1980 and 1994, the ROI population grew by 14.0 percent, compared to 20.0 percent in Idaho. Within the ROI, Jefferson County experienced the largest increase at 20.4 percent, while Butte County's population decreased by 8.9 percent. Population and housing trends are summarized in Figure 3.4.8–2.

The increase in the total number of housing units in the ROI between 1980 and 1990, 6.5 percent, was approximately 3.5 percent less than the increase in the number of housing units in Idaho. The total number of housing units in the ROI for 1990 was 71,025. The 1990 ROI homeowner and renter vacancy rates, 2.2 and 8.5 percent, respectively, were similar to those in Idaho.

Community Services. Education, public safety, and health care characteristics were used to assess the level of community services in the INEL ROI. Figure 3.4.8–3 presents school district characteristics for the INEL ROI. Figure 3.4.8–4 presents public safety and health care characteristics.

Education. In 1994, 14 school districts provided public education services and facilities in the INEL ROI. As shown in Figure 3.4.8–3, these school districts operated at between 38-percent (Swan Valley School District) and 101.2-percent (Firth School District) capacity. The average student-to-teacher ratio for the INEL ROI in 1994 was 18.5:1. The Shelley School District had the highest ratio at 22.2:1.

Public Safety. City, county, and State law enforcement agencies provided police protection to the residents in the ROI. In 1994, a total of 340 sworn police officers were serving the five-county ROI. Idaho Falls employed the largest number of officers (82) and Bannock County had the highest officer-to-population ratio (2.5 sworn officers per 1,000 persons). The average ROI officer-to-population ratio was 1.6 officers per 1,000 persons. Figure 3.4.8–4 compares police force strengths across the ROI.

Fire protection services in the INEL ROI were provided by 465 paid and volunteer firefighters in 1995. The district with the highest firefighter-to-population ratio was located in Butte County, with 7.5 firefighters per 1,000 persons, as indicated in Figure 3.4.8–4. Jefferson County employed the greatest number of firefighters (90). The average firefighter-to-population ratio in the ROI was 2.2 per 1,000 persons.

Health Care. There were five hospitals serving the five-county ROI in 1994. Figure 3.4.8–4 displays the hospital bed-to-population ratios for the INEL ROI counties. During 1994, all hospitals were operating at below capacity, with hospital occupancy rates ranging from 48.0 percent in Bannock County to 60.8 percent in Bingham County.

In 1994, a total of 264 physicians served the ROI, with the majority (129) located in Bonneville County. Figure 3.4.8–4 shows that the physician-to-population ratios for the ROI ranged from no physicians in Butte County to 1.6 physicians per 1,000 persons in Bonneville County and Bannock County. The average ROI physician-to-population ratio was 1.2 physicians per 1,000 persons.

Local Transportation. Vehicular access to INEL is provided by U.S. Routes 20 and 26 to the south and State Routes 22 and 33 to the north. U.S. Routes 20 and 26 and State Routes 22 and 33 all share rights-of-way west of INEL (see Figure 2.2.3–1 and Figure 2.2.3–2).

There is one current road improvement project affecting access to INEL. U.S. Route 20 is being upgraded from two to four lanes and turn lanes are being added at intersections from 2 to 5 km (1 to 3 mi) west of Idaho Falls. In addition, there are four planned road improvement projects that could affect future access to INEL. The first is an upgrade from two to four lanes and the addition of turn lanes at intersections from 5 to 8 km (3 to 5 mi) west of Idaho Falls. The second is the resurfacing of State Route 33 from the intersection of State Routes 28 and 33 to 13 km (8 mi) east of this intersection. The third is the resurfacing of Interstate 15 from Fort Hall to South Blackfoot. The last is the asphalt chip seal of U.S. Route 26 from the U.S. Route 20 and U.S. Route 26 intersection to Blackfoot (ID DOT 1995a:1).

There are two road segments that could be affected by the storage and disposition alternatives. The first road segment is U.S. Route 20 from U.S. Routes 26 and 91 at Idaho Falls to U.S. Route 26 East. In 1995 this road segment operated at level of service D. The second road segment is U.S. Routes 20 and 26 from U.S. Route 26 East to State Routes 22 and 33. This segment operated at level of service B in 1995.

The Department shuttle vans provide transportation between INEL facilities and Idaho falls for the 4,000 DOE and contractor personnel who work at INEL. The major railroad in the ROI is the Union Pacific Railroad. The railroad's Blackfoot-to-Arco branch provides rail service to the southern portion of INEL. A DOE-owned spur connects the Union Pacific Railroad to INEL by a junction at Scovill Siding. There are no navigable waterways within the ROI capable of accommodating waterborne transportation of material shipments to INEL.

Fanning Field in Idaho Falls and Pocatello Municipal Airport in Pocatello provide jet air passenger and cargo service for both national and local carriers. Numerous smaller private airports are located throughout the ROI.